ABSTRACT

The invention provides an electrostatically-controllable diffraction grating including a plurality of electrically isolated and stationary electrodes disposed on a substrate. At least one row of a plurality of interconnected actuation elements is provided, with each actuation element suspended, by a corresponding mechanically constrained support region, over the substrate by a vertical actuation gap and including a conducting actuation region connected to the corresponding support region and disposed in a selected correspondence with at least one substrate electrode. A mirror element is provided, for at least one actuation element in at least one row of actuation elements, including an optically reflecting upper surface, and being vertically suspended over a corresponding actuation element by a mechanically constrained mirror support region that is connected to the corresponding actuation element and that defines a vertical mirror gap. A mirror deflection region connected to the mirror support region and is free to be deflected through the mirror gap. The mirror gap is less than the actuation gap of a corresponding actuation element and is selected to produce controlled and stable displacement of the actuation region of a corresponding actuation element through a displacement range to a specified point in the actuation gap when an actuation voltage is applied between an actuation region and a corresponding stationary electrode. This enables diffraction of a beam of light incident on the grating as the light beam is reflected from the upper surfaces of the mirror elements.